

ALPINE FLORA OF TUNGNATH IN GARHWAL HIMALAYA¹

J. K. SEMWAL AND R. D. GAUR²

The present communication is an account of Angiosperms collected from an alpine area (Tungnath) in Garhwal Himalaya during the years 1977-1978. Tungnath is one of the most important peaks situated in front of the famous Chaukhamba and Kedarnath peaks, in between 30°30'N and 79°15'E. The dominant families of this zone are Ranunculaceae, Fumariaceae, Caryophyllaceae, Rosaceae, Saxifragaceae, Apiaceae, Asteraceae, Gentianaceae, Scrophulariaceae, Polygonaceae, Orchidaceae, Liliaceae and Poaceae. A total number of 280 species and 157 genera represented by 50 families have been recorded.

INTRODUCTION

The Himalayas are a reservoir of many natural resources, of which the vegetational aspect is predominant. Although several workers took interest in the collection and presentation of Himalayan flora even before the 19th century (Burkill 1965) and upto recently (Rau 1975), still a comprehensive account, specially on the exploration of alpine plants on regional basis is lacking. Royle, Coventry and Blatter studied the beautiful plants of Western Himalaya (Rau 1975) laying more emphasis on the Kashmir valley in the extreme west of the Himalayas. Duthie (1906) presented the revised catalogue of plants of Kumaon and adjacent portions of Garhwal, originally based on the collections made by Strachey and Winterbottom during 1846 to 1849, including the works of Wallich, Royle, Falconer, Blinkworth and Thomson. Holdsworth and Smythe, members of the British Kamet Expedition collected plants from Bhyundar valley, 'The Valley of Flowers' (Smythe 1932 and 1938). Recently Rau (1961) has made comprehensive

collections from different altitudes of north Garhwal. Rau (1975) has also published an extensive compilation of high altitude flowering plants of Western Himalaya.

GEOGRAPHY AND CLIMATE

The approximate bearings of Tungnath region are 30°30'N and 79°15'E. The explored area is a moist alpine zone ranging from 3250 to 4600 m above sea level. As usual in alpine zones in India the climatic conditions include dense frost, fog, heavy hailstorms, extremely low temperature, high light intensity, high wind velocity and lower Oxygen and Carbon dioxide concentration. There are sharp fluctuations regarding these weather conditions even in the same day. Low rainfall is generally reported from other alpine areas but comparatively high rainfall was observed in this area. Total rainfall from June to September during 1978 was recorded 163.57 cm and maximum rainfall was 51.77 cm in the month of July. Minimum and Maximum atmospheric temperature during the study period was -6 and 28°C respectively.

VEGETATION

The alpine vegetation of this part has many characteristic features in connection with the

¹ Accepted November 1979.

²Department of Botany, Garhwal University, Srinagar-246 174, (U.P.).

separation zone from timber line, seasonal succession and distributional pattern. Some important plants which separate the alpine zone from timber line are *Clematis barbellata*, *C. montana*, *Berberis edgeworthiana*, *Hypericum hookerianum*, *Rhododendron campanulatum*, *R. arboreum* in south facing slopes and *Anemone rivularis*, *Thalictrum chelidonii*, *Paeonia emodi*, *Thlaspi cochleariforme*, *Syringa emodi*, *Skimmia laureola*, *Geum urbanum*, *Sorbus foliolosa*, *Angleca glauca*, *Trillium govanianum*, in north-west facing slopes. Some temperate plants, e.g. *Rhododendron arboreum*, *Dipsacus mitis* and *Lysimachia* spp. are also well adapted to the harsh alpine conditions.

On the basis of distribution the alpine plants represent distinct habitats. They are found on exposed dry rocks, crevices, ravines and on much fertile loamy soils constituting the alpine meadows.

The plant species which appear soon after the snows melt, are *Primula denticulata*, *Oxygraphis polypetala* and *Gentiana* spp. immediately followed by *Ranunculus* spp., *Caltha palustris*, *Gagea lutea* and *Anemone obtusiloba*, and species of *Potentilla*, *Pedicularis*, *Senecio*, *Saussurea*, *Polygonum* and others during July-August. In the late flowering season in alpine zone *Delphinium vestitum*, *Selinum vaginatum*, *Pleurospermum densiflorum*, *Tanacetum longifolium*, *Taraxacum officinale* are observed. Some plants like *Oxygraphis polypetala*, *Ranunculus* spp. and *Gentiana* spp. reflower at the end of season during October-November. Periodical changes in the flowering resulted in the appearance of beautiful matted meadow of blue, violet, red, pink, yellow and white colour during different months of the favourable season. The general mode of perennation of plants is through rhizomes, rootstocks, runners, suckers, bulbs and bulbils.

ENUMERATION OF SPECIES

This work is primarily a record of alpine plants collected during the years 1977 and 1978. In this work Bentham and Hooker's system of classification has been followed with some modifications particularly in splitting of the families as proposed by Hutchinson (1959). An attempt has been made to incorporate nomenclature changes. Local names of the plants where available have been given after the botanical names and localities with altitude have also been mentioned. Field number of each specimen is given in bracket and the specimens are preserved in the Herbarium of Botany Department, Garhwal University, Srinagar.

DICOTYLEDONS
RANUNCULACEAE

- Aconitum balfourii** Stapf (Loc.-Mitha bish)
Tall erect herb with blue flowers. Tungnath, 3500 m. Sept. 1977 (2658).
- A. heterophyllum** Wall. ex Royle (Loc.-Atish)
Erect herb with dull green purple veined flowers. Tungnath, 3500 m. Sept. 1977 (2634).
- Anemone narcissifolia** Linn. var. **polyanthes** Finnet & Gagnep. (Loc.-Kakrya)
Hairy herb with white flowers. Tungnath, 3500 m. June 1977 (2694).
- A. obtusiloba** D. Don (Loc.-Chotu Kakrya)
Herb with white and blue flowers. Tungnath, 3500 m. June 1977 (2700).
- A. rivularis** Buch.-Ham.
Herb with white flowers. Below Tungnath, 3250 m. June 1977 (2693).
- A. vitifolia** Buch.-Ham.
Herb with whitish flowers. Tungnath, 3500 m. Sept. 1977 (2606).
- Caltha palustris** Linn.
Herb with bright yellow flowers. Tungnath, 3500 m. May 1977 (2695).

Clematis barbellata Edgew.

Climbing shrub with dull purple backed flowers. Rawanshila, 3250 m. June 1978 (2833).

C. montana Buch.-Ham. ex DC.

Climbing shrub with white flowers. Rawanshila, 3250 m. June 1978 (2831).

Delphinium vestitum Wall. ex Royle

Hairy herb with blue flowers. Tungnath, 3500 m. Oct. 1977 (2681).

Oxygraphis polypetala (Royle) Hook. f. & Thoms.

Small herb with bright yellow flowers. Tungnath, 3500 m. May and Oct. 1977 (2702).

Ranunculus hirtellus Royle

Herb with bright yellow flowers. Tungnath, 3500 m. May and Sept. 1977 (2612).

R. hyperboreus Rottb.

Small creeping herb with yellow flowers. Tungnath, 3500 m. June 1978 (2805).

Thalictrum alpinum Linn.

Small herb with greenish drooping flowers. Tungnath, 3500 m. June 1978 (2827).

T. chelidonii DC.

Tall herb with the bulbils in the leaf axils. Zabrya, 3250 m. Oct. 1978 (2758).

T. pauciflorum Royle

Herb on rocks with greenish flowers. Tungnath, 3500 m. Sept. 1978 (2701).

PAEONACEAE

Paeonia emodi Wall. ex Royle (Loc.-Chandra)

Tall erect herb with white flowers. Chakdhar, 3250 m. June 1978 (2759).

BERBERIDACEAE

Berberis edgeworthiana Schneid. (Loc.-Chotra)

Shrub with yellow flowers and ovoid red berries. Rawanshila, 3250 m. July 1978 (2676).

B. jaeschkeana Schneid. (Loc.-Kingeroh)

Spiny shrub with yellow flowers and red berries. Tungnath, 3500 m. July 1978 (2803).

B. kumaonensis Schneid. (Loc.-Jhuru)

Procumbent shrub with yellow flowers and ovoid red berries. Tungnath, 3500 m. July 1978 (2760).

CIRCAEASTERACEAE

Circaeaster agrestis Maxim.

Small herb bearing minute greenish flowers at the terminal rosette of leaves. Tungnath, 3500 m. Aug. 1978 (2625).

PAPAVERACEAE

Meconopsis aculeata Royle (Loc.-Kalyari)

Prickly herb with blue purple flowers. Tungnath, 3500 m. Aug. 1978 (2816).

M. robusta Hook. f. & Thoms.

Prickly herb with light yellow flowers. Tungnath, 3500 m. Aug. 1978 (2823).

FUMARIACEAE

Corydalis cashmeriana Royle

Delicate herb with sky blue flowers. Tungnath, 3500 m. June 1978 (2705).

C. falconeri Hook. f. & Thoms.

Herb with yellow flowers. Tungnath, 3500 m. June 1977 (2706).

C. govaniana Wall.

Herb with terminal dense many yellow flowered racemes. Tungnath, 3500 m. June 1977 (2703).

C. meifolia Wall.

Herb with purple tipped yellow flowers. Above Tungnath, 4600 m. Sept. 1978 (2763).

C. vaginans Royle

Delicate herb with yellow flowers. Tungnath, 3500 m. June 1977 (2704).

BRASSICACEAE

Arcyosperma primulifolium (Thoms.) O. E. Schulz

ALPINE FLORA OF TUNGNATH

Herb, with white flowers on rocks. Tugnath, 3500 m. June 1977 (2707).

Capsella bursa-pastoris (Linn.) Medik. (Loc.-Botlya)

Herb with white flowers. Chakdhar, 3250 m. June 1978 (2764).

Cardamine scutata Thunb .

Glabrous herb with white flowers. Tugnath, 3500 m. July 1977 (2608).

Draba gracillima Hook. f. & Thoms.

Hairy herb with small yellow flowers. Tugnath, 3500 m. June 1978 (2812).

Thlaspi cochleariforme DC.

Spreading herb with white flowers. Tugnath, 3500 m. May 1978 (2765).

VIOLACEAE

Viola biflora Linn.

Glabrous herb with yellow flowers. Tugnath, 3500 m. June 1977 (2708).

V. canescens Wall. (Loc.-Banafsa or Dundi-birali).

Stoloniferous herb with lilac flowers. Rawan-shila, 3250 m. May 1978 (2766).

CARYOPHYLLACEAE

Cerastium holosteoides Fries. (Loc.-Badyalu)
Herb with white flowers. Tugnath, 3500 m. Aug. 1978 (2890).

Gypsophila cerastioides D. Don

Spreading herb with purple streaked white flowers. Tugnath, 3500 m. June 1977 (2709).

Lychnis nutans Benth.

Glandular herb with purple flowers. Tugnath, 3500 m. July 1977 (2604).

L. pilosa Edgew.

Hairy herb, with solitary terminal purple flowers on rocks. Tugnath, 3500 m. Sept. 1978 (2888).

Sagina saginoides (Linn.) Karsten

Small decumbent herb with white flowers. Tugnath, 3500 m. Aug. 1978 (2889).

Stellaria alsine Grimm

Spreading herb with small green flowers. Tugnath, 3500 m. Aug. 1978 (2843).

S. cherleriae (Fisch.) Williams

Densely tufted herb with small white flowers. Tugnath, 3500 m. Sept. 1977 (2670).

S. patens D. Don

Decumbent herb with white flowers. Tugnath, 3500 m. Aug. 1978 (2767).

HYPERICACEAE

Hypericum hookerianum W. & A.

Small shrub with golden yellow flowers. Daun, 3300 m. Aug. 1977 (2639).

H. nepaulense Choisy

Diffused herb with yellow flowers. Daun, 3300 m. July 1977 (2710).

GERANIACEAE

Geranium wallichianum Sw. (Loc.-Ratanjot)
Spreading herb with pink purple flowers which are streaked at the base. Tugnath, 3500 m. Sept. 1977 (2643).

G. polyanthes Edgew. & Hook. f.

Herb with pink flowers. Tugnath, 3500 m. Aug. 1978 (2768).

BALSAMINACEAE

Impatiens brachycentra Kar. & Kir. (Loc.-Chaula)

Erect herb with pinkish white flowers. Tugnath, 3500 m. Sept. 1977 (2669).

I. roylei Walp.

Herb with light pink flowers. Tugnath, 3500 m. Sept. 1978 (2769).

RUTACEAE

Skimmia leureola Sieb. & Zucc.

Glabrous aromatic shrub with yellow flowers. Chakdhar, 3250 m. June 1978 (2770).

FABACEAE

Astragalus himalayanus Klotzsch

Hairy herb of alpine meadows; Tungnath, 3500 m. Oct. 1978 (2891).

Parochetus communis Buch.-Ham. ex D. Don

Herb with blue flowers. Tungnath, 3500 m. Oct. 1978 (2680).

Piptanthus nepalensis D. Don

Shrub with yellow flowers. Tungnath, 3500 m. June 1977 (2711).

ROSACEAE

Aruncus dioicus (Walter) Fern.

Erect herb with white flowers. Tungnath, 3500 m. Aug. 1978 (2820).

Cotoneaster acuminatus Lindl.

Shrub with white flowers and red oblong fruits. Tungnath, 3500 m. July 1978 (2834).

C. microphyllus Wall. ex Lindl. (Loc.-Ruens)

Procumbent much branched shrub with white flowers and red globose fruits. Tungnath, 3500 m. June 1977 (2719).

Fragaria daltoniana Gay. (Loc.-Kailashikaphal)

Stoloniferous herb with white solitary flower and elongate ovoid bright scarlet fruit. Tungnath, 3500 m. July 1978 (2893).

F. vesca Linn. (Loc.-Gandakafal)

Herb with white flowers and sub-globose scarlet fruit. Tungnath, 3500 m. July 1978 (2894).

Geum elatum (Royle) Hook. f.

Herb with yellow flowers and much hairy hooked seeds. Chandrashila, 3750 m. July 1977 (2720).

G. urbanum Linn.

Herb with yellow flowers and hairy seeds. Chakdhar, 3250 m. July 1978 (2753).

Potentilla arbuscula D. Don

Shrub with yellow flowers. Tungnath, 3500 m. June 1977 (2721).

P. argyrophylla Wall. ex Lehm.

Herb covered with soft silky white hairs and

yellow flowers. Chandrashila, 3750 m. June 1978 (2810).

P. atrosanguinea Lodd.

Herb with dark crimson flowers. Tungnath, 3600 m. June 1977 (2715).

P. eriocarpa Wall. ex Lehm.

Glabrous herb with yellow flowers. Tungnath, 3500 m. Sept. 1977 (2671).

P. fulgens Wall. ex Hook. (Loc.-Bajradanti)

Hairy herb with yellow flowers. Tungnath, 3500 m. June 1977 (2716).

P. gelida C. A. Mey.

Spreading glandular aromatic herb with yellow flowers. Rawanshila, 3450 m. June 1978 (2802).

P. leuconota D. Don

Herb with subumbellate yellow flowers. Tungnath, 3500 m. July 1978 (2752).

P. microphylla D. Don

Herb forming moss like tufts with yellow flowers. Tungnath, 3500 m. June 1977 (2713).

P. polyphylla Wall. ex Lehm.

Herb with yellow flowers. Tungnath, 3500 m. June 1978 (2718).

Rosa sericea Lindl. (Loc.-Safed Gulab)

Prickly shrub with white flowers and red fruits. Tungnath, 3500 m. July 1978 (2837).

Rubus nutans Wall. (Loc.-Kailashi Hisar)

Herb with a woody rootstock, white flowers and scarlet drupelets. Tungnath, 3500 m. Aug. 1978 (2751).

R. pedunculatus D. Don (Loc.-Hisar)

Large rambling prickly shrub with light pink flowers and pink drupelets. Tungnath, 3500 m. Aug. 1978 (2844).

Sibbaldia cuneata Hornem. ex O. Ktze.

Procumbent herb with small pale yellow flowers. Tungnath, 3500 m. June 1977 (2714).

S. micropetala (D. Don) Hand.-Mazz.

Spreading herb with small yellow flowers. Tungnath, 3500 m. June 1977 (2712).

Sorbus foliolosa (Wall.) Spach (Loc.-Thelaka)

Small tree with white flowers and red fruits.

ALPINE FLORA OF TUNGNATH

Tungnath, 3500 m. July 1978 (2838).

Spiraea canescens D. Don (Loc.-Chhari)
Shrub with white flowers. Tungnath, 3500 m.
June 1978 (2717).

S. bella Sims.
Shrub with pink flowers. Rawanshila, 3450 m.
June 1978 (2829).

S. vestita Wall. ex G. Don
Tall erect herb with white flowers and green
achenes. Zabrya, 3250 m. Aug. 1978 (2750).

SAXIFRAGACEAE

Astible rivularis Buch.-Ham.
Erect hairy herb with greenish-yellow flowers.
Tungnath, 3500 m. July 1978 (2895).

Bergenia stracheyi (Hook. f. & Thoms.)
Engl. (Loc.-Pakhan bhed)
Procumbent glabrous herb with white flowers.
Chandrashila, 3750 m. July 1978 (2817).

Chrysosplenium tenellum Hook. f. & Thoms.
Annual procumbent glabrous herb with green
yellow flowers. Tungnath, 3500 m. June 1978
(2806).

Parnassia affinis Hook. f. & Thoms.
Small glabrous herb with white flowers. Tung-
nath, 3500 m. Aug. 1977 (2611).

P. nubicola Wall. ex Royle
Herb with white solitary terminal flowers.
Chandrashila, 3750 m. Aug. 1977 (2621).

Saxifraga brachypoda var. **fimbriata** (Wall.)
Engl. & Irmsch.

Small erect herb with spinulose leaves and
golden yellow flowers. Tungnath, 3500 m.
Aug. 1977 (2614).

S. brunoniana Wall. ex Sternb.
Tufted herb with yellow flowers. Tungnath,
3500 m. Aug. 1978 (2761).

S. diversifolia Wall. ex DC. var. **parnassifolia**
(D. Don) Engl.

Erect herb with yellow flowers. Tungnath,
3600 m. Aug. 1978 (2613).

S. filicaulis Wall. ex DC.
Small herb with yellow flowers. Tungnath,
3500 m. Sept. 1978 (2771).

S. hispidula D. Don
Small hispid herb with golden yellow flowers,
Tungnath, 3500 m. Aug. 1978 (2762).

S. pallida Wall. ex DC.
Small herb with white flowers. Tungnath, 3500
m. July 1977 (2603).

GROSSULARIACEAE

Ribes glaciale Wall.
Trailing shrub with pink flowers. Tungnath,
3500 m. Aug. 1978 (2807).

CRASSULACEAE

Sedum linearifolium Royle
Glabrous herb with white flowers. Above
Tungnath, 4600 m. Sept. 1978 (2772).

S. linearifolium var. **sinuatum** (Royle) R.
Hamet

Glabrous herb with light pink flowers. Tung-
nath, 3500 m. Aug. 1977 (2615).

S. quadrifidum Pall.
Tufted herb with dark pink flowers. Tung-
nath, 3500 m. June 1977 (2722).

Sempervivum acuminatum Decne.
Glabrous and fleshy herb with light purple
rose flowers. Tungnath, 3500 m. Oct. 1977
(2686).

ONAGRACEAE

Circaea imaicola (Asch. et Magn.) Hand.-
Mazz.

Erect glabrous herb with white flowers. Tung-
nath, 3500 m. Aug. 1977 (2626).

Epilobium royleanum Hausskn.
Erect herb with pink flowers. Tungnath,
3500 m. Sept. 1977 (2666).

APIACEAE

Acronema tenera Edgew.
Small herb with oblong fruits which are nar-

rowed upwards. Tungnath, 3500 m. Sept. 1977 (2609).

Angelica glauca Edgew. (Loc.-Chora)
Tall herb with white flowers. Tungnath, 3400 m. Aug. 1978 (2754).

Bupleurum longicaule Wall. ex DC.
Erect glabrous herb with blackish flowers. Tungnath, 3500 m. Aug. 1977 (2618).

Chaerophyllum acuminatum Lindl.
Hairy herb with oblong fruits narrowed at the tip. Tungnath, 3500 m. June 1977 (2724).

Heracleum brunonis (DC.) C. B. Clarke
Hairy erect herb with white flowers. Tungnath, 3500 m. Aug. 1977 (2628).

Osmorhiza aristata Makino & Yabe.
Erect herb with oblong fruits. Zabrya, 3250 m. Sept. 1978 (2755).

Pleurospermum densiflorum (Lindl.) C. B. Clarke (Loc.-Taggar)
Erect herb with white margined bracteoles and ellipsoid fruits. Tungnath, 3500 m. Sept. 1978 (2617).

Salinum candollei DC. (Loc.-Moor)
Tall erect herb with white flowers. Tungnath, 3500 m. Sept. 1977 (2629).

S. vaginatum C. B. Clarke (Loc.-Bhootkeshi)
Erect glabrous herb with white flowers. Tungnath, 3500 m. Sept. 1978 (2756).

Trachydium roylei Lindl.
Small herb with white bracteoles and glistening blackish fruits. Tungnath, 3500 m. Sept. 1978 (2757).

Vicatia coniiifolia DC.
Erect glabrous herb with ovoid fruits narrowed at the apex. Tungnath, 3500 m. Aug. 1978 (2773).

CAPRIFOLIACEAE

Lonicera myrtillus Hook. f. & Thoms.
Procumbent shrub with white flowers and blue ellipsoid berries. Tungnath, 3500 m. July 1978 (2840).

Viburnum foetens Decne.
Large shrub with white and light pink flowers and red ovoid drupes. Tungnath, 3500 m. May 1978 (2774).

RUBIACEAE

Galium asperuloides Edgew.
Glabrous herb with white flowers. Tungnath, 3500 m. Aug. 1978 (2813).

G. mollugo Linn. (Loc.-Kura)
Rambling herb with minute white flowers. Tungnath, 3500 m. Sept. 1978 (2775).

G. pauciflorum Bunge
Small herb with minute white flowers. Tungnath, 3500 m. June 1978 (2847).

VALERIANACEAE

Nardostachys jatamansi DC. (Loc.-Jatamansi or Masi)
Aromatic herb with dull white flowers. Tungnath, 3500 m. Aug. 1977 (2723).

Valeriana hardwickii Wall.
Erect herb with white flowers and hairy achenes. Tungnath, 3500 m. Aug. 1977 (2623).

DIPSACACEAE

Dipsacus mitis D. Don
Tall erect herb with white heads. Tungnath, 3500 m. Sept. 1978 (2777).

Morina longifolia Wall. ex DC. (Loc.-Kandara)
Prickly herb with deep pink flowers. Tungnath, 3500 m. Sept. 1978 (2818).

Triplostegia glandulifera Wall. ex DC.
Erect glandular herb with white flowers. Tungnath, 3500 m. Sept. 1977 (2667).

ASTERACEAE

Adenocaulon bicolor Hook. f.
Hairy erect herb with white flowers. Zabrya, 3250 m. Sept. 1978 (2781).

- Anaphalis contorta** Hook. f. (Loc.-Buglya)
Erect woolly herb with small dense dirty-white heads. Tugnath, 3500 m. Aug. 1978 (2782).
- A. cuneifolia** Hook. f. (Loc.-Buglya)
Erect herb with black centred white heads. Tugnath, 3500 m. Aug. 1977 (2673).
- A. royleana** DC. (Loc.-Buglya)
Woolly herb with black centred white heads. Tugnath, 3500 m. Aug. 1977 (2645).
- Brachyactis menthadora** Benth.
Tall erect herb with pale blue flowers. Tugnath, 3500 m. Sept. 1978 (2778).
- Carpesium cernuum** Linn.
Hairy erect herb with yellow drooping heads. Chakdhar, 3250 m. Aug. 1978 (2779).
- Circium verutum** (D. Don) Spreng. (Loc.-Kandaru).
Prickly erect herb with purplish white heads. Tugnath, 3500 m. Sept. 1978 (2780).
- Cicerbita cyanea** (D. Don) Beauv.
Erect herb with purplish heads and white pappus. Zabrya, 3250 m. Sept. 1978 (2790).
- C. macrorhiza** (Royle) Beauv. (Loc.-Karhatu)
Glabrous herb on rocks with purple heads. Tugnath, 3500 m. Sept. 1978 (2789).
- C. violaeifolia** (Decne.) Beauv. (Loc.-Karhatu)
Glabrous herb with purple heads and white pappus. Tugnath, 3500 m. Oct. 1977 (2675).
- Doronicum roylei** DC.
Tall erect herb with yellow flowers. Tugnath, 3500 m. Aug. 1977 (2646).
- Erigeron alpinus** var. **multicaulis** Hook. f.
Erect herb with purple flowers. Tugnath, 3500 m. Aug. 1977 (2672).
- Gerbera kunzeana** Braun & Aschers.
Herb with long peduncled heads and pale pappus. Tugnath, 3500 m. Oct. 1978 (2785).
- G. lanuginosa** Benth. (Loc.-Kabas)
Small herb with white solitary heads. Tugnath, 3500 m. June 1978 (2783).
- Jurinea macrocephala** (DC.) C. B. Clarke (Loc.-Bish Kandara)
Stemless herb with sessile purplish heads. Tugnath, 3500 m. Aug. 1978 (2819).
- Leontopodium himalayanum** DC.
Tufted woolly herb with white flowers. Above Tugnath, 4600 m. Sept. 1978 (2784).
- Ligularia amplexicaulis** DC. (Loc.-Kalank)
Robust herb with yellow corymbose heads. Tugnath, 3500 m. Aug. 1977 (2635).
- L. arnicoides** DC. (Loc.-Jarhil)
Tall erect herb with yellow drooping heads. Tugnath, 3500 m. Sept. 1978 (2791).
- Myriactis nepalensis** Less.
Erect slightly hispid herb with light purple heads. Tugnath, 3500 m. June 1978 (2808).
- M. wallichii** Less.
Erect hairy herb with purplish brown heads. Tugnath, 3500 m. Sept. 1978 (2796).
- Saussurea hypoleuca** Spreng.
Erect herb with solitary globose dark purple heads. Tugnath, 3500 m. Oct. 1977 (2682).
- S. leontodontoides** (DC.) Lipsch.
Stemless herb on rocks with purple heads. Tugnath, 3500 m. Oct. 1977 (2683).
- S. obvallata** (DC.) Sch.-Bip. (Loc.-Brahm kamal)
Aromatic herb with hemispherical black tipped heads. Above Tugnath, 4600 m. Oct. 1978 (2786).
- S. piptathera** Edgew.
Erect herb with purple dense terminal corymbose heads. Tugnath, 3500 m. Sept. 1978 (2787).
- S. taraxacifolia** Wall. ex DC.
Prostrate aromatic herb with purple heads. Tugnath, 3500 m. Sept. 1977 (2622 and 2684).
- Senecio alatus** Wall. ex DC.
Pubescent herb with dirty brown pappus. Tugnath, 3500 m. Sept. 1978 (2792).
- S. chrysanthemoides** DC.
Erect glabrous herb with yellow flowers. Tugnath, 3500 m. Aug. 1977 (2633).
- S. graciliflorus** DC.
Tall glabrous herb with yellowish brown heads.

- Tungnath, 3500 m. Sept. 1978 (2793).
S. kunthianus Wall. ex DC.
 Aromatic erect herb with yellow flowers. Tungnath, 3500 m. Aug. 1977 (2634).
S. levingii C. B. Clarke
 Tall glabrous herb with yellowish brown heads. Tungnath, 3500 m. Sept. 1978 (2794).
S. rufinervis DC.
 Robust herb with small brownish yellow heads. Tungnath, 3500 m. Sept. 1978 (2795).
Tanacetum longifolium Wall. ex DC. (Loc.-Guggul)
 Aromatic herb with yellow corymbose heads. Tungnath, 3500 m. Sept. 1977 (2661).
Taraxacum officinale Weber (Loc.-Karhatu)
 Prostrate glabrous herb with yellow solitary heads. Tungnath, 3500 m. Sept. 1977 (2660).

CAMPANULACEAE

- Campanula argyrotricha** Wall. ex DC.
 Procumbent hairy herb with sky blue flowers. Tungnath, 3500 m. Oct. 1977 (2678).
Cyananthus integer Wall. ex Benth.
 Procumbent glabrous herb on rocks with blue flowers. Tungnath, 3500 m. Oct. 1977 (2697).
C. lobatus Wall. ex Benth.
 Decumbent herb with blue flowers. Tungnath, 3500 m. Aug. 1977 (2616).
C. microphyllus Edgew.
 Glabrous trailing herb with blue flowers. Tungnath, 3500 m. Oct. 1977 (2677 and 2627).

ERICACEAE

- Cassiope fastigiata** D. Don
 Tufted small shrub with drooping white flowers. Tungnath, 3500 m. June 1977 (2725).
Gaultheria tricophylla Royle (Loc.-Bhuinla)
 Prostrate small shrub with white flowers and blue berries. Tungnath, 3500 m. June 1977 (2726).

- Rhododendron anthopogon** D. Don (Loc.-Kodya)
 Small shrub with dull yellow flowers. Tungnath, 3500 m. June 1977 (2727).
R. arboreum Sm. (Loc.-Burans)
 Tree with red flowers. Tungnath, 3500 m. June 1978 (2797).
R. barbatum Wall. ex G. Don
 Tree with deep red flowers. Rawanshila, 3300 m. June 1978 (2798).
R. campanulatum D. Don (Loc.-Simaru)
 Small tree with light pink flowers. Tungnath, 3500 m. June 1977 (2728).
R. lepidotum Wall. ex G. Don
 Shrub with dark pinkish-red flowers. Tungnath, 3500 m. June 1977 (2729).

PRIMULACEAE

- Lysimachia japonica** Thunb.
 Small herb with white flowers. Zabrya, 3250 m. June 1978 (2825).
L. prolifera Klatt.
 Creeping herb with light pink flowers. Tungnath, 3500 m. Aug. 1977 (2687).
Primula denticulata Sm.
 Herb with dark purple to pale lilac flowers. Tungnath, 3500 m. Aug. 1977 (2821).
P. petiolaris Wall.
 Mealy herb with purple flowers. Tungnath, 3500 m. May 1978 (2799).
P. reidii Duthie (Loc.-Hainsandari)
 Herb, with solitary white flowers on rocks. Tungnath, 3500 m. Aug. 1978 (2845).

OLEACEAE

- Syringa emodi** Wall. ex G. Don
 Small tree with oblong pointed tipped capsules. Zabrya, 3250 m. Sept. 1978 (2800).

GENTIANACEAE

- Gentiana argentea** Royle ex D. Don
 Small herb with blue flowers. Tungnath, 3500 m. June 1977 (2731).

G. carinata Griseb.

Herb with dense glabrous leaves and terminal clustered blue flowers. Tugnath, 3500 m. June 1977 (2824).

G. leucomelaena Maxim.

Prostrate herb with long exserting capsules. Tugnath, 3500 m. June 1978 (2824).

G. stipitata Edgew.

Prostrate herb with greenish white flowers. Tugnath, 3500 m. Oct. 1977 (2679).

Swertia ciliata (G. Don) B. L. Burt (Loc. Chirayata)

Erect herb with purplish white flowers pink at the base. Tugnath, 3500 m. Oct. 1977 (2674).

S. cuneata D. Don

Erect herb with light purple flowers. Tugnath, 3500 m. Aug. 1977 (2631).

S. speciosa D. Don (Loc.-Chirayata).

Tall erect herb with greenish flowers. Tugnath, 3500 m. Aug. 1977 (2632).

S. tetragona C. B. Clarke

Erect herb with whitish flowers. Tugnath, 3500 m. Sept. 1978 (2853).

BORAGINACEAE

Cynoglossum wallichii G. Don (Loc.-Lichkura)

Hairy herb with blue flowers. Tugnath, 3500 m. Aug. 1978 (2601).

Hackelia uncinata (Benth.) C.E.C. Fischer

Laxly hairy herb with dark blue and pink flowers. Tugnath, 3500 m. Aug. 1978 (2652).

Lindelofia longiflora (Benth.) Bail.

Hairy erect herb with dark blue and pink flowers. Tugnath, 3500 m. Aug. 1978 (2656).

Onosma emodi Wall.

Densely hairy herb with light pink tipped flowers. Tugnath, 3500 m. Aug. 1978 (2854).

SCROPHULARIACEAE

Euphrasia platyphylla Pennell

Small herb with white pink streaked flowers.

Tugnath, 3500 m. Aug. 1978 (2619).

Falconeria himalaica Hook. f.

Decumbent glabrous herb, with blue flowers on rocks. Tugnath, 3500 m. July 1977 (2688).

Hemiphragma heterophyllum Wall.

Prostrate diffused herb with dimorphic leaves, rosy flowers and red fruits. Tugnath, 3500 m. May 1978 (2826).

Pedicularis hoffmeisteri Klotzsch

Glabrous herb with yellow flowers. Tugnath, 3500 m. Aug. 1977 (2641).

P. porrecta Wall. ex Benth.

Decumbent glabrous herb with pink flowers. Tugnath, 3500 m. July 1977 (2846).

P. gracilis Wall.

Tall erect herb with rose purple flowers white at the base. Tugnath, 3500 m. July 1978 (2640).

Picrorhiza kurrooa Royle ex Benth. (Loc.-Katuki or Karui)

Spreading herb with bluish flowers and bladderly white seeds. Tugnath, 3500 m. June 1978 (2809).

Scrophularia calycina Benth.

Glabrous tall erect herb with light green flowers. Tugnath, 3500 m. July 1978 (2836).

Veronica cana Wall.

Erect hairy herb with light blue flowers. Tugnath, 3500 m. July 1977 (2689).

V. macrostemon Bunge ex Ledeb.

Hairy herb with terminal crowded subsessile white flowered racemes. Tugnath, 3500 m. July 1978 (2647).

OROBANCHACEAE

Boschniakia himalaica Hook. f. & Thoms.

Parasite on *Rhododendron campanulatum* with dense flowered ochreous brown racemes and tuberous base. Rawanshila, 3250 m. June 1978 (2776).

LENTIBULARIACEAE

Utricularia orbiculata Wall.

Small herb with white flowers yellow at the base. Tungnath, 3500 m. Aug. 1977 (2620).

LAMIACEAE

Clinopodium umbrosum (M. Bieb.) Koch

Herb with purple flowers. Daun, 3250 m. Sept. 1977 (2659).

Elsholtzia strobilifera Benth.

Hairy aromatic herb with pale purple flowers. Tungnath, 3500 m. Sept. 1977 (2668).

Phlomis bracteosa Royle ex Benth.

Tall stout herb with blue-purple flowers. Tungnath, 3500 m. Aug. 1977 (2605).

Prunella vulgaris Linn.

Ascending herb with violet-purple flowers. Tungnath, 3500 m. Aug. 1978 (2855).

Salvia hians Royle ex Hook.

Viscidly hairy tall erect herb with blue flowers. Tungnath, 3500 m. Aug. 1977 (2630).

S. nubicola Sweet.

Viscidly hairy erect herb with yellow flowers. Zabrya, 3250 m. Sept. 1978 (2856).

Teucrium royleanum Wall.

Hairy herb with purple flowers. Daun, 3250 m. Sept. 1978 (2857).

PLANTAGINACEAE

Plantago brachyphylla Edgew. (Loc.-Isabgul)

Glabrous rosette herb with oblong black seeds. Tungnath, 3500 m. June 1978 (2832).

POLYGONACEAE

Oxyria digyna Hill (Loc.-Kailashi almorha)

Glabrous herb with green-pink flowers. Tungnath, 3500 m. Sept. 1977 (2665).

Polygonum affine D. Don

Herb with crowded red flowers. Above Tungnath, 4600 m. Sept. 1978 (2858).

P. alpinum All. (Loc.-Sarain).

Tall erect herb with white flowers. Tungnath, 3500 m. Sept. 1977 (2663).

P. amplexicaule D. Don

Large glabrous herb with red flowers. Tungnath, 3500 m. June 1977 (2733).

P. delicatulum Meissn.

Tufted glabrous herb with minute axillary greenish flowers. Tungnath, 3500 m. Aug. 1977 (2644).

P. emodi Meissn.

Creeping glabrous herb with red flowers. Tungnath, 3500 m. July 1977 (2607).

P. filicaule Wall. ex Meissn. (Loc.-Tufrya)

Slightly hairy herb with whitish and pink flowers which are sometimes tinged pink. Tungnath, 3500 m. Aug. 1977 (2699).

P. macrophyllum D. Don (Loc.-Kukhri)

Erect herb with terminal red spikes. Tungnath 3500 m. July 1977 (2691).

P. nepalensis Meissn.

Glabrous herb with terminal greenish and pink heads. Tungnath, 3500 m. Aug. 1977 (2637).

P. perpusillum Hook. f.

Small herb with pink flowers. Tungnath, 3500 m. July 1978 (2852).

P. rumicifolium Royle ex Bab. (Loc.-Kanthla)

Erect herb with dull pink flowers. Tungnath, 3500 m. June 1978 (2841).

P. sinuatum Royle

Creeping glabrous herb with pink flowers. Tungnath, 3500 m. Aug. 1977 (2636).

P. sphaerocephalum Wall. ex Meissn.

Creeping herb rooting at the nodes with white flowers. Chakdhar, 3250 m. June 1977 (2692).

P. vaccinifolium Wall. ex Meissn.

Creeping woody shrub with rose-red flowers. Tungnath, 3500 m. Sept. 1977 (2662).

P. viviparum Linn.

Herb with pink solitary erect spike lower portion of which is replaced by bulbils. Tungnath, 3500 m. Aug. 1977 (2732).

ALPINE FLORA OF TUNGNATH

Rheum emodi Wall. ex Meissn. (Loc.-Dolya or Archa)

Tall erect herb with white flowers. Tugnath, 3500 m. June 1978 (2804).

R. moorcroftianum Royle

Tall erect herb with pinkish flowers. Above Tugnath, 4200 m. Aug. 1978 (2859).

Rumex nepalensis Spreng. (Loc.-Khulya)

Erect herb with green flowers. Tugnath, 3500 m. July 1978 (2860).

EUPHORBIACEAE

Euphorbia pilosa Linn. (Loc.-Daya)

Erect glabrous herb with yellow green flowers. Chakdhar, 3250 m. June 1977 (2690).

E. stracheyi Boiss. (Loc.-Dudhya Bish)

Prostrate herb with yellow green flowers. Tugnath, 3500 m. June 1977 (2698).

URTICACEAE

Parietaria debilis Forst.

Straggling herb with minute greenish flowers. Tugnath, 3500 m. Sept. 1978 (2861).

Pilea wightii Weddel var. **roylei** Hook. f.

Small creeping herb with minute pinkish flowers. Tugnath, 3500 m. Aug. 1978 (2842).

BETULACEAE

Betula utilis D. Don (Loc.-Bhooj or Bhojpatra)

Tree with peeling bark and hanging catkins. Chandrashila, 3750 m. July 1978 (2862).

SALICACEAE

Salix lindleyana Wall. ex Anderss.

Prostrate creeping shrubby herb with green yellow catkins. Tugnath, 3500 m. July 1977 (2738).

MONOCOTYLEDONS

ORCHIDACEAE

Cypripedium elegans Reichb. f.

Hairy, two leaved delicate herb with pink solitary flower. Tugnath, 3500 m. June 1978 (2835).

Goodyera fusca Hook. f.

Herb with fleshy leaves and white flowers. Tugnath, 3500 m. Sept. 1977 (2664).

G. repens R. Br.

Glabrous herb with white flowers. Tugnath, 3500 m. Sept. 1978 (2863).

Habenaria fallax King & Pantl.

Glabrous herb with greenish flowers. Tugnath, 3500 m. Aug. 1977 (2655).

H. latilabris Hook. f.

Erect herb with green flowers. Daun, 3250 m. Aug. 1978 (2864).

Herminium gramineum Lindl.

Herb with yellowish flowers. Tugnath, 3500 m. Aug. 1978 (2865).

Malaxis muscifera (Lindl.) O. Ktze.

Glabrous herb with minute yellowish green flowers. Tugnath, 3500 m. June 1977 (2736).

Orchis chusua D. Don

Glabrous herb with purple flowers. Tugnath, 3500 m. July 1977 (2610).

O. latifolia Linn. (Loc.-Hathajorhi)

Erect herb with palmate tubers and purple flowers. Tugnath, 3500 m. July 1977 (2735).

O. spathulata Reichb. f. ex Hook. f.

Glabrous herb with whitish purple flowers. Tugnath, 3500 m. June 1977 (2737).

Peristylus elisabethae (Duthie) P. F. Hunt

Small glabrous herb with white flowers. Tugnath, 3500 m. Aug. 1978 (2866).

SCITAMINACEAE

Roscoea alpina Royle

Herb with dark purple flowers. Tugnath, 3500 m. Aug. 1978 (2867).

HAEMODORACEAE

- Aletris nepalensis** Hook. f.
Herb with white flowers. Tungnath, 3500 m.
Aug. 1978 (2868).
Ophiopogon intermedius D. Don
Glabrous herb with white drooping flowers.
Chakdhar, 3250 m. Aug. 1978 (2869).

IRIDACEAE

- Iris kumaonensis** Wall. ex G. Don
Glabrous herb with blue flowers. Chandra-
shila, 3750 m. July 1978 (2801).

LILIACEAE

- Allium stracheyi** Baker (Loc.-Pharan)
Herb with white flowers. Tungnath, 3500 m.
Sept. 1978 (2870).
A. wallichii Kunth (Loc.-Lainka)
Tall herb with dark purple flowers. Tungnath,
3500 m. Sept. 1977 (2657).
Clintonia udensis Trautv. var. **alpina** (Kunth
ex Baker) Hara
Glabrous herb with white flowers. Tungnath,
3500 m. June 1978 (2839).
Fritillaria roylei Hook.
Herb with yellow-green solitary flowers. Tung-
nath, 3500 m. May 1977 (2744).
Gagea lutea Schultz. f. (Loc.-Naunya)
Delicate glabrous herb with yellow flowers.
Tungnath, 3500 m. June 1977 (2743).
Lloydia alpina Salisb.
Herb with white flowers. Tungnath, 3500 m.
June 1977 (2740).
L. longiscapa Hook. f.
Herb with white flowers which are pink at the
base. Tungnath, 3500 m. June 1977 (2739).
Nomocharis nana (Kotzsch) E. H. Wilson
Herb on rocks with bluish-purple flowers.
Tungnath, 3500 m. June 1978 (2850).
Polygonatum geminiflorum Decne.
Glabrous herb with white flowers. Tungnath,

3500 m. June 1978 (2872).

P. verticillatum All.

Glabrous herb with dirty white flowers. Tung-
nath, 3500 m. June 1978 (2871).

Smilacina purpurea Wall.

Stoloniferous herb with purple pink flowers.
Tungnath, 3500 m. June 1977 (2742).

Smilax elegans Wall.

Small glabrous shrub with greenish-white
flowers. Rawanshila, 3400 m. June 1978
(2828).

Trillium govanianum Wall. ex Royle

Herb with dark pink tepals and yellow sta-
mens. Below Tungnath, 3250 m. May 1977
(2741).

JUNCACEAE

Juncus elegans Royle ex D. Don

Herb with white flowers. Tungnath, 3500 m.
Aug. 1977 (2649).

J. himalensis Klotzsch & Garcke

Glabrous herb with dark brown flowers. Above
Tungnath, 4600 m. Sept. 1978 (2873).

J. membranaceus Royle ex D. Don

Glabrous herb with white flowers. Tungnath,
3500 m. July 1977 (2745).

Luzula multiflora (Retz) Lef.

Hairy herb with brown flowers. Tungnath,
3500 m. June 1978 (2830).

L. spicata DC.

Herb with dark brown flowers. Above Tung-
nath, 4600 m. Sept. 1978 (2874).

ARACEAE

Arisaema intermedium Blume

Erect herb with green white striped spathe.
Tungnath, 3500 m. July 1978 (2875).

A. jacquemontii Blume

Herb with green spathe. Tungnath, 3500 m.
June 1978 (2851).

A. wallichianum Hook. f. (Loc.-Meen)

Herb with dark purple white striped spathe.
Tungnath, 3500 m. June 1978 (2848).

CYPERACEAE

- Carex inanis** Kunth.
Grass with grey green spikes. Tugnath, 3500 m. June 1977 (2749).
- C. setigera** D. Don
Grass with brownish spikes. Tugnath, 3500 m. June 1977 (2748).
- Kobresia nitens** C. B. Clarke
Grass with greenish spikes. Tugnath, 3500 m. June 1977 (2746).

POACEAE

- Agrostis canina** Linn.
Grass with purple-green panicles. Tugnath, 3500 m. July 1977 (2642).
- A. munroana** Aitch. & Hemsl.
Grass with greenish spikes. Tugnath, 3500 m. Aug. 1978 (2876).
- A. pilosula** Trin.
Grass with green panicles. Tugnath, 3500 m. July 1978 (2654).
- A. stolonifera** Linn.
Erect grass with purplish spikelets. Tugnath, 3500 m. Aug. 1978 (2877).
- Danthonia cacymeriana** Jaub. & Spach. (Loc.-Mamcha)
Densely tufted grass with light pale spikelets. Tugnath, 3500 m. Aug. 1977 (2651).
- Deyeuxia pulchella** (Griseb.) Hook. f.
Tufted grass with dark purple-green spikelets. Tugnath, 3500 m. Aug. 1978 (2653).
- D. scabrescens** (Griseb.) Munro ex Duthie
Tall grass with light purple spikelets. Tugnath, 3500 m. Aug. 1978 (2879).
- Festuca gigantea** Vill.
Loosely tufted grass with pale green spikelets. Tugnath, 3500 m. Aug. 1978 (2880).
- F. kashmiriana** Stapf
Tufted grass with green panicles. Tugnath, 3500 m. Aug. 1978 (2881).

F. rubra Linn.

Erect grass with two nodes and green spikelets. Tugnath, 3500 m. Aug. 1978 (2882).

F. valesiaca Schleich.

Tufted grass with pale green spikelets. Tugnath, 3500 m. Aug. 1978 (2883).

Helictotrichon virescens (Nees ex Steud.) Henr.

Tall erect slender grass with green spikelets. Tugnath, 3500 m. Aug. 1977 (2650).

Poa alpina Linn.

Densely tufted grass with greenish panicles. Tugnath, 3500 m. Aug. 1978 (2884).

P. annua Linn.

Stoloniferous glabrous grass with green panicles. Tugnath, 3500 m. Aug. 1977 (2696).

P. nepalensis Wall. ex Duthie

Erect grass with long pedicelled green spikelets. Tugnath, 3500 m. Aug. 1978 (2885).

P. pagophila Bor

Grass on rocky slopes with long pedicelled purple spikelets. Tugnath, 3500 m. Aug. 1978 (2886).

P. supina Schrad.

Erect glabrous herb with pale green spikelets. Tugnath, 3500 m. Aug. 1978 (2887).

Trisetum clarkei (Hook. f.) R. R. Stew.

Tall erect slender grass with shining green spikelets. Tugnath, 3500 m. Oct. 1977 (2685).

ACKNOWLEDGEMENTS

We are grateful to Dr. A. N. Purohit for providing all the facilities and encouragement. Grateful thanks are also due to the authorities of the Botanical Survey of India, Northern Circle, Dehra Dun for providing necessary help in identification. We also acknowledge Mr. B. P. Nautiyal's help during collection. This work was supported by a grant from Department of Science and Technology, (SERC), Govt. of India.

REFERENCES

BURKILL, I. H. (1965): Chapters on the History of Botany in India. Botanical Survey of India, Calcutta.

DUTHIE, J. F. (1906): Catalogue of the plants of Kumaon and of the adjacent portion of Garhwal and Tibet, based on the collections made by Strachey and Winterbottom during the years 1846-1849 and on the catalogue originally prepared in 1852. London.

HUTCHINSON, J. (1959): The Families of Flowering Plants. Oxford.

RAU, M. A. (1961): Flowering Plants and Ferns of North Garhwal, Uttar Pradesh, India. *Bull. Bot. Surv. Ind.* 3: 215-51.

————— (1975): High Altitude Flowering Plants of West Himalaya. Botanical Survey of India, Indian Botanic Garden, Howrah-3.

SMYTHE, F. S. (1932): Kamet conquered. London.

————— (1938): The Valley of Flowers. London.